

Exercise 9.3

Question 1:

Carry out the multiplication of the expressions in each of the following pairs:

(i) $4p, q+r$

(ii) $ab, a-b$

(iii) $a+b, 7a^2b^2$

(iv) $a^2-9, 4a$

(v) $pq+qr+rp, 0$

Answer 1:

(i) $4p \times (q+r) = 4p \times q + 4p \times r$
 $= 4pq + 4pr$

(ii) $ab \times (a-b) = ab \times a - ab \times b$
 $= a^2b - ab^2$

(iii) $(a+b) \times 7a^2b^2 = a \times 7a^2b^2 + b \times 7a^2b^2$
 $= 7a^3b^2 + 7a^2b^3$

(iv) $(a^2-9) \times 4a = a^2 \times 4a - 4a \times 9$
 $= 4a^3 - 36a$

(v) $(pq+qr+rp) \times 0 = pq \times 0 + qr \times 0 + rp \times 0$
 $= 0 + 0 + 0 = 0$

Question 2:

Complete the table:

	First expression	Second expression	Product
(i)	a	$b+c+d$
(ii)	$x+y-5$	$5xy$
(iii)	p	$6p^2-7p+5$
(iv)	$4p^2q^2$	p^2-q^2
(v)	$a+b+c$	abc

Answer 2:

	First expression	Second expression	Product
(i)	a	$b+c+d$	$a(b+c+d)$ $= a \times b + a \times c + a \times d$ $= ab+ac+ad$
(ii)	$x+y-5$	$5xy$	$5xy(x+y-5)$ $= 5xy \times x + 5xy \times y - 5xy \times 5$ $= 5x^2y+5xy^2-25xy$
(iii)	p	$6p^2-7p+5$	$p(6p^2-7p+5)$ $= p \times 6p^2 - p \times 7p + p \times 5$ $= 6p^3-7p^2+5p$
(iv)	$4p^2q^2$	p^2-q^2	$4p^2q^2(p^2-q^2)$ $= 4p^2q^2 \times p^2 - 4p^2q^2 \times q^2$ $= 4p^4q^2-4p^2q^4$
(v)	$a+b+c$	abc	$abc(a+b+c)$ $= abc \times a + abc \times b + abc \times c$ $= a^2bc+ab^2c+abc^2$

Question 3:

Find the product:

(i) $(a^2) \times (2a^{22}) \times (4a^{26})$

(ii) $\left(\frac{2}{3}xy\right) \times \left(\frac{-9}{10}x^2y^2\right)$

(iii) $\left(\frac{-10}{3}pq^3\right) \times \left(\frac{6}{5}p^3q\right)$

(iv) $x \times x^2 \times x^3 \times x^4$

Answer 3:

$$(i) \quad (a^2) \times (2a^{22}) \times (4a^{26}) = (2 \times 4)(a^2 \times a^{22} \times a^{26}) \\ = 8 \times a^{2+22+26} = 8a^{50}$$

$$(ii) \quad \left(\frac{2}{3}xy\right) \times \left(\frac{-9}{10}x^2y^2\right) = \left(\frac{2}{3} \times \frac{-9}{10}\right)(x \times x^2 \times y \times y^2) \\ = \frac{-3}{5}x^3y^3$$

$$(iii) \quad \left(\frac{-10}{3}pq^3\right) \left(\frac{6}{5}p^3q\right) = \left(\frac{-10}{3} \times \frac{6}{5}\right)(p \times p^3 \times q^3 \times q) \\ = -4p^4q^4$$

$$(iv) \quad x \times x^2 \times x^3 \times x^4 = x^{1+2+3+4} = x^{10}$$

Question 4:

(a) Simplify: $3x(4x-5)+3$ and find values for (i) $x=3$ (ii) $x=\frac{1}{2}$.

(b) Simplify: $a(a^2+a+1)+5$ and find its value for (i) $a=0$ (ii) $a=1$ (iii) $a=-1$.

Answer 4:

$$(a) \quad 3x(4x-5)+3 = 3x \times 4x - 3x \times 5 + 3 = 12x^2 - 15x + 3$$

$$(i) \quad \text{For } x=3, \quad 12x^2 + 15x + 3 = 12(3)^2 - 15 \times 3 + 3 \\ = 12 \times 9 - 45 + 3 = 108 - 45 + 3 = 66$$

$$(ii) \quad \text{For } x=\frac{1}{2}, \quad 12x^2 - 15x + 3 = 12\left(\frac{1}{2}\right)^2 - 15 \times \frac{1}{2} + 3 = 12 \times \frac{1}{4} - \frac{15}{2} + 3 \\ = 6 - \frac{15}{2} = \frac{12-15}{2} = \frac{-3}{2}$$

$$(b) \quad a(a^2+a+1)+5 = a \times a^2 + a \times a + a \times 1 + 5 = a^3 + a^2 + a + 5$$

$$(i) \quad \text{For } a=0, \quad a^3 + a^2 + a + 5 = (0)^3 + (0)^2 + (0) + 5 \\ = 0 + 0 + 0 + 5 = 5$$

$$(ii) \quad \text{For } a=1, \quad a^3 + a^2 + a + 5 = (1)^3 + (1)^2 + (1) + 5 \\ = 1 + 1 + 1 + 5 = 8$$

$$\begin{aligned}
 \text{(iii) For } a = -1, \quad a^3 + a^2 + a + 5 &= (-1)^3 + (-1)^2 + (-1) + 5 \\
 &= -1 + 1 - 1 + 5 = -2 + 6 = 4
 \end{aligned}$$

Question 5:

- (a) Add: $p(p-q)$, $q(q-r)$ and $r(r-p)$.
 (b) Add: $2x(z-x-y)$ and $2y(z-y-zx)$.
 (c) Subtract: $3l(l-4m+5n)$ from $4l(10n-3m+2l)$.
 (d) Subtract: $3a(a+b+c) - 2b(a-b+c)$ from $4c(-a+b+c)$.

Answer 5:

- (a) $p(p-q) + q(q-r) + r(r-p) = p^2 - pq + q^2 - qr + r^2 - rp$
 $= p^2 + q^2 + r^2 - pq - qr - rp$
- (b) $2x(z-x-y) + 2y(z-y-zx) = 2xz - 2x^2 - 2xy + 2yz - 2y^2 - 2xy$
 $= 2xz - 2xy - 2xy + 2yz - 2x^2 - 2y^2$
 $= -2x^2 - 2y^2 - 4xy + 2yz + 2zx$
- (c) $4l(10n-3m+2l) - 3l(l-4m+5n) = 40ln - 12lm + 8l^2 - 3l^2 + 12lm - 15ln$
 $= 8l^2 - 3l^2 - 12lm + 12lm + 40ln - 15ln$
 $= 5l^2 + 25ln$
- (d) $4c(-a+b+c) - [3a(a+b+c) - 2b(a-b+c)]$
 $= -4ac + 4bc + 4c^2 - [3a^2 + 3ab + 3ac - 2ab + 2b^2 - 2bc]$
 $= -4ac + 4bc + 4c^2 - [3a^2 + 2b^2 + 3ab - 2bc + 3ac - 2ab]$
 $= -4ac + 4bc + 4c^2 - [3a^2 + 2b^2 + ab + 3ac - 2bc]$
 $= -4ac + 4bc + 4c^2 - 3a^2 - 2b^2 - ab - 3ac + 2bc$
 $= -3a^2 - 2b^2 + 4c^2 - ab + 4bc + 2bc - 4ac - 3ac$
 $= -3a^2 - 2b^2 + 4c^2 - ab + 6bc - 7ac$